Review

Methadone Maintenance and Lactation: A Review of the Literature and Current Management Guidelines

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Abstract

Methadone offers significant therapeutic benefits to the population of pregnant, opiate-dependent women and is currently the treatment of choice for this group. Yet the problem of women who elect to breastfeed while on methadone maintenance frequently vexes providers. Although breast milk offers advantages clearly beneficial to the general population of infants, there is debate about recommending breastfeeding to postpartum women receiving methadone maintenance. Although previous research has shown that amounts of methadone in breast milk appear to be very small, and therefore breastfeeding seems to be safe, women on methadone do not often breastfeed, for a variety of reasons. This article provides an overview of the issues facing providers in treating methadone-maintained women who elect to breastfeed. A comprehensive review of existing literature on the subject is offered, along with clinical advice for practitioners providing care to this population of women and children. *J Hum Lact*. 20(1):62-71.

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The problem of substance abuse among women of childbearing age has overwhelmed the health care delivery system since the early 1970s. In 1994, the National Institute on Drug Abuse found that 9.4% of pregnant women had used illicit drugs during the previous year.[1] In a review of several studies from the 1990s, King[2] concluded that at least 10% of pregnant women expose their children to illicit substances. These figures, although startling, are likely to be underestimates of the true scope of the problem of chemical dependency in women, because of variable hospital screening and assessment polices[3] and psychological and social pressure to deny substance abuse during pregnancy.[4]

Methadone maintenance has been a treatment option for opiate-dependent individuals since the 1960s and has been shown to be a cost-effective method of treatment that is beneficial to society.[5] Methadone is currently the only opioid replacement therapy available for the population of pregnant, opioid-dependent women in the United States.[6] Methadone offers significant benefits for this group, not the least of which includes improvement in prenatal care,[7] fewer complications of pregnancy,[8] engagement in substance abuse treatment, and improved birth outcomes.[9] However, there are significant negative consequences for methadone-exposed newborns, including neonatal abstinence syndrome (NAS), or "withdrawal," a constellation of symptoms frequently requiring prolonged hospitalization and treatment with narcotics. Sixty to 90% of opiate-exposed infants develop NAS.[10]

Drug-dependent women not in substance abuse treatment may present a risk to their infants by breastfeeding and should be carefully evaluated. If they have inadequate prenatal care and/or no access to substance abuse

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treatment, it is likely that they are not good candidates for breastfeeding. Women in treatment can provide consent for discussion with their counselors regarding their decisions to nurse their infants.

The purpose of this review is to discuss the medical and psychosocial risks and benefits of breastfeeding among opiate-dependent, postpartum women who are receiving treatment with methadone. A comprehensive review of existing literature on the subject is offered, along with clinical advice for practitioners providing care to this population of women and children.

The Benefits of Breastfeeding by Women on Methadone Maintenance

The issue of breastfeeding by women requiring methadone therapy frequently faces treatment providers. It is a vexing question because breast milk provides significant benefits for developing infants. It is the general consensus of the international pediatric community that breastfeeding is the optimal form of infant nutrition.[11] Breastfeeding is beneficial to both mothers and infants.[12] The practice promotes interaction and bonding between a mother and her infant.[13] Breastfeeding provides passive immunity to infection[14] and seems to provide some benefits for protection against otitis media,[15] obesity,[16] allergy,[17] and asthma,[18] as well as protection against sudden infant death syndrome.[19,20] Breast milk has been shown to confer some advantages to early brain development. Improved cognitive and intellectual development in early and middle childhood has been associated with breastfeeding.[21,22] A recent study has even demonstrated an association between the duration of breastfeeding and intelligence in young adults.[23]

For a population of children at high risk for developmental, emotional, behavioral, and medical complications,[24] as well as abuse and neglect,[25] it would seem that the group of children exposed to methadone in utero would substantially benefit from breastfeeding. Breastfeeding has been suggested as an appropriate treatment strategy for managing the symptoms of withdrawal in methadone-exposed infants.[26] Drug-abusing mothers, at high risk for psychiatric and other impairments, would also seem to benefit from the improved attachment to their infants afforded by nursing. In addition, lactation is associated with the suppression of the secretion of stress-responsive neurohormones in response to physical stressors[27] and a short-term suppression of the cortisol response to mental stress,[28] resulting in an overall reduction in stress response, a clear benefit to a group of women for whom physical and psychological stress is an ever-present problem. Women who breastfeed experience other health benefits, including fertility reduction[29] and a lower risk for breast cancer.[30] Given the multitude of negative messages associated with substance abuse and maternity, breastfeeding may serve to enhance maternal self-esteem by allowing a mother to provide optimal nutrition for her infant.[31] Yet today, many methadone-maintained mothers are prohibited from breastfeeding for a variety of reasons that stem from (1) health care providers, (2) drug-exposed infants, or (3) women requiring methadone maintenance themselves.

The Barriers to Breastfeeding for Women on Methadone Maintenance

Health Care Providers

Treating perinatal practitioners may lack confidence that there is enough safety information to recommend methadone and may be unaware of current recommendations. Many explicitly discourage mothers on methadone maintenance from breastfeeding. Although the 2001 American Academy of Pediatrics (AAP) guidelines[32] state that methadone is "usually compatible with breastfeeding," no dose information or other guidelines are included. Previous AAP (1994, 1989)[33,34] guidelines have stated that breastfeeding should be allowed only for women on 20 mg or less of methadone at delivery, a dose so small as to be inconsequential, considering the higher doses of methadone usually required at the end of pregnancy.

Nursing staff members, particularly neonatal intensive care unit nurses, are often uncomfortable feeding compromised infants with breast milk from women receiving methadone, not knowing exactly what the milk contains ("if she takes methadone, what else might be in this milk?"), a reasonable if not pejorative question that frequently creates an adversarial relationship between a mother and the nurse caring for her infant.

Drug-Exposed Infants

An infant undergoing acute or subacute NAS has symptomatology, including hypertonicity, irritability, abnormal movements, hypersensitivity, feeding problems, and a failure to thrive, that would preclude breastfeeding without intensive support from a lactation consultant skilled in treating this population. Infants undergoing NAS may thrash at the breast or clamp down on the nipple, causing considerable discomfort

for their mothers. Infants who have difficulty with state regulation may spend a good deal of time crying or sleeping and may not be able to achieve the alert and aware state required for nursing. Hypertonic infants may be very difficult to position properly for breastfeeding. Infants with nasal stuffiness frequently pull away from the breast. An experienced lactation consultant can intervene successfully with all of these problems when working in concert with a medical professional able to manage NAS. But the population that most often prevents drug-exposed infants from receiving breast milk is the drug-dependent mothers themselves.

Women Requiring Methadone Maintenance

There are a variety of reasons why drug-dependent women do not often breastfeed. These include family and social factors and/or the multiple medical and psychiatric comorbidities often seen in postpartum women requiring methadone therapy.

Today's consumer-oriented society frequently promotes formula feeding, even for women who decide to breastfeed (we have all seen the "gifts" from formula companies of supplemental formula for breastfeeding women). There are cultural[35] as well as racial and ethnic[36] and sociological[37] disparities in rates of breastfeeding among women in the United States. Many drug-dependent women come from multigenerational drug-abusing families[24] and are without positive role models for breastfeeding after birth.[37] Chemically dependent women frequently lack support from significant others.[38] Fathers still actively using drugs may be threatened by the drug abstinence that breastfeeding mothers must achieve and sometimes work overtly or covertly to make them unsuccessful.

Maternal medical comorbid conditions, such as HIV infections, which are more common among drug-abusing people,[39] may preclude breastfeeding. A lack of education regarding many issues, from methadone maintenance to concurrent hepatitis C infection, discourages many mothers. Psychiatric comorbidity is common in this population. Rates of depression and other mood disorders have been estimated for this group of women to range from 75% to 90%.[40,41] Many psychiatric medications, including lithium, fluoxetine, and Haldol, are associated with reported effects in newborns.[32] In addition, many women are polysubstance abusers. Cocaine, heroin, PCP, and amphetamines have all been described as having adverse effects on infants when transmitted in breast milk.[32]

Low self-esteem may make some women unable to trust their own bodies to provide adequate nutrition for their infants. Women experienced with failure (eg, failure at previous attempts at substance abuse treatment, failure at interpersonal relationships, failure at employment, and failure at the retention of custody of previous children) will expect to fail at breastfeeding and give up after a day or two, even with support. A surprisingly low tolerance for discomfort discourages many drug-dependent women from breastfeeding when they develop sore nipples or uterine cramping.

Women requiring methadone therapy frequently have histories of exposure to violence. It has been reported that lifetime rates of violence among substance-abusing pregnant women range from 40% (sexual abuse) through 73.1% (emotional abuse) to 76.1% (physical abuse).[42] Breastfeeding among abuse survivors, particularly among sexual abuse survivors, can be fraught with difficult issues that create negative experiences.[43] Women with histories of sexual victimization may view their breasts as sexual objects not appropriate for contact with newborns.

Overwhelming feelings of guilt surrounding their part in their infants' difficulties with NAS distance many women from their infants.[24] A woman in recovery with a newborn has difficulty focusing on the needs of her infant when her own needs may be great, such as financial woes, housing issues, intimate partner violence, postpartum depression, newly opened children's protective services cases, and so on.[24] Another common reason that women elect not to breastfeed their infants is their instability in their recovery process and their fear of relapse to illicit substances. Most women in treatment will recognize the difficulties associated with relapse to drug use and breastfeeding. Women desiring to breastfeed to keep themselves from relapsing should be carefully evaluated and counseled regarding this decision and may not be appropriate candidates.

The Amount of Methadone in Breast Milk

There are only a small number of studies, all with small samples, delineating amounts of methadone found in breast milk. A review of this knowledge is presented below, and summarized in Table 1.

The first studies of breast milk and methadone occurred in the mid-1970s. A 1974 study by Kreek et al[44] described a woman on 50 mg of methadone (though her methadone dose was decreased from 110 mg/d to 9 mg/d in the last 37 days of gestation) who

Table 1. Breast Milk and Methadone Maintenance: A Review of the Literature

Study	*N*	*Samples Collected (days postpartum)*	*Maternal Methadone Dose (mg/d),*	*Range of Breast Milk/Plasm Methadone (mean)*	*Range of Concentration of Methadone in Milk (mean, µg/mL)*	*Range of Methadone Intake by Infant (mg/d)*
Kreek et al, 1974[44]	1	4-8	50	0.05-0.28 (0.13)	0.02-0.12 (0.05)	0.06
Blinick et al, 1975[45]	10	3-10	10-80	0.29-1.89 (0.83)	0.05-0.57 (0.27)	
Kreek, 1979[46]	2	5-8	25, 50	0.05-1.20	0.01-0.12	0.06-0.10
Pond et al, 1985[47]	2	7, 21		0.32, 0.61	0.01-0.70	0.01, 0.03
Geraghty et al, 1997[48]	2	11, 14	73, 60 (split)	0.52-0.86 (0.66), 0.91-1.53 (1.22)	0.11-0.18 (0.13), 0.11-0.25 (0.17)	0.07, 0.09
Wojnar-Horton et al, 1997[49]	12	3-26	20-80	0.13-1.19 (0.44)	0.039-0.23 (0.12)	(17.4 µg/kg/d)
McCarthy and Posey, 2000[50]	8	3-202	25-180 (all but one split)		0.019-0.26 (0.095)	0.05
Begg et al, 2001[51]	8	1-11	40-105	R-methadone: (0.68), 95% CI, 0.58, 0.89; S-methadone: (0.38), 95% CI, 0.26, 0.50	R-methadone: 0.042-0.259 (0.149); S-methadone: 0.026-0.126 (0.088)	R-methadone: 3.54% maternal dose; S-methadone: 2.09% maternal dose; R + S, 2.8% maternal dose
	2	18, 27	75, 75	R-methadone: 0.54, 0.39; S-methadone: 0.30, 0.24	R-methadone: 0.089, 0.135 S-methadone: 0.076, 0.119	R-methadone: 1.9%,; 2.5% maternal dose; S-methadone: 1.6%, 2.2% maternal dose

yielded breast milk samples on days 4 to 8 postpartum. The average ratio of breast milk to plasma methadone was 0.13 (a computed average of 7 ratios of breast milk to plasma methadone obtained); the average concentration of methadone in breast milk ranged from 0.02 to 0.12 µg/mL (average computed, 0.05 µg/mL); and the maximal methadone exposure, calculated using peak levels, to the infant was 0.057 mg/d. This group concluded that it was "unlikely that any adverse effect could result from ingestion by neonates born to mothers maintained on methadone."

In 1975, Blinick et al[45] described a series of 10 women on methadone doses ranging from 10 to 80 mg. Samples were collected on days 3 to 10 postpartum, and the investigators measured breast milk and plasma methadone concentrations. They found that the average ratio of breast milk to plasma methadone was 0.83, and the average concentration of methadone in breast milk was 0.27 µg/mL. They concluded that "within our experience, there have been no adverse results from breastfeeding (among methadone maintained women) and it is permitted if desired."

A 1979 article by Kreek[46] described 2 women on 50 and 25 mg of methadone daily. Breast milk concentrations of methadone ranged from 0.01 to 0.12 µg/mL, and the ratios of milk to plasma concentrations ranged from 0.05 to 1.2. On the basis of an average neonatal milk consumption of between 400 and 765 mL/d from the first to the third month of life, and using peak concentrations of methadone in breast milk found in this study, Kreek concluded that the maximum amounts of methadone ingestible by a breastfed infant would range from 0.06 to 0.1 mg/d. Kreek concluded that "it is unlikely that these very small amounts could have any significant pharmacologic effects."

A 1985 study by Pond et al[47] described 2 women who underwent breast milk and plasma sampling at 1 and 3 weeks postpartum. The authors found ratios of breast milk to plasma methadone of 0.32 and 0.61, and the concentrations of methadone in breast milk for these women ranged from 0.01 to 0.70 µg/mL. Maximal amounts of methadone ingestible by the infants were reported at 0.01 to 0.03 mg/d. These researchers concluded that "these amounts are unlikely to have any clinical effect."

Two articles in 1997 shed more light into this arena. Geraghty et al[48] described 2 women on 73 mg (single dose) and 60 mg (split dose) of methadone who gave breast milk samples on postpartum days 11 and 14, respectively. The average breast milk methadone concentrations for these women were 0.132 and 0.169 µg/mL, with average ratios of breast milk to plasma methadone of 0.661 and 1.215. These authors concluded, "the negligible amount of methadone found transmitted in breast milk is unlikely to have adverse effects on the infant regardless of mother's methadone dose." Wojnar-Horton et al[49] described a series of 12 women on doses of methadone ranging from 20 to 80 mg. This group

analyzed 2 breast milk samples per sampling period, one prefeeding and one postfeeding, and found that the postfeeding samples had higher milk methadone concentrations by approximately 33% because of the increased milk lipid content over the course of a feeding. The infants were between 3 and 26 days old at the sample collection time. The mean ratio of milk to plasma methadone in this study was 0.44, and the daily mean infant exposure to methadone was 17.4 μg/kg; the mean relative infant dose as a percentage of the maternal dose was 2.79%. Blood samples were collected from 8 infants, and in 7, the plasma methadone concentration was below the assay limit. In 1 infant, plasma methadone was measured at 6.5 μg/L. Six of the 12 infants required treatment for NAS, which is approximately what might be expected. This group recommended that "women on a methadone maintenance program should not be discouraged from breast feeding."

A study published in 2000 by McCarthy and Posey[50] evaluated 8 methadone-maintained women (doses of 25-180 mg) providing random breast milk samples at times from 3 days to 6 months postpartum. Breast milk methadone levels ranged from 0.019 to 0.26 μg/mL, with a mean of 0.95 μg/mL. Using mean breast milk methadone levels and average infant breast milk intake, the mean daily methadone level ingestible by infants was calculated at 0.05 mg/d.

Finally, in a recent study by Begg et al,[51] milk was sampled from mothers receiving methadone (doses of 40-105 mg) on days 1 to 27 days after birth. The relative distributions of R-enantiomers and S-enantiomers for immature milk, defined as milk in the early postpartum period (<15 days), and mature milk (≥15 days) were determined by the authors. The mean ratios of milk to plasma were 0.68 for R-methadone (95% confidence interval [CI], 0.48-0.89) and 0.38 (95% CI, 0.26-0.50) for S-methadone for immature milk (n = 8); the ratios of milk to plasma were 0.54 and 0.39 for R-methadone and 0.30 and 0.24 for S-methadone for the 2 women who delivered mature milk samples. The relative (weight-adjusted) infant dose for the sum of R-methadone and S-methadone in immature milk was 2.8% (1.7%-3.9%) of the maternal dose. The authors concluded that breastfeeding during medium-dose to high-dose methadone maintenance appears to be safe according to conventional criteria, although it is unlikely to be sufficient to prevent NAS.

It is currently unknown how even small concentrations of opiates delivered to the developing brain of an infant may affect future development, and further studies are needed in this area.

Two studies reported adverse events in connection with methadone and lactation. The first, a 1977 case report by Smialek et al,[52] described the 5-week-old infant of a mother on methadone maintenance who was found dead after a brief period of being "cranky." The infant was born 1 month prematurely at 2500 g. At the time of his death, 1 month later, he weighed only 2640 g. His blood methadone level was very high at 0.04 mg/dL, and it was concluded that the methadone in the mother's breast milk was the route of ingestion for this child. It seems much more likely with today's knowledge that the methadone was administered to the infant by exogenous means. A 1999 article by Malpas et al[53] described 2 infants who developed treatable NAS after the abrupt discontinuation (at 5 weeks and 16 days of age) of breastfeeding by women receiving 70 and 130 mg of methadone daily, respectively. It is unclear how these events occurred in these infants, because the amounts of methadone ingestible at these ages would be very small.

Given the studies above, it would seem that a general consensus among the authors might be that the amount of methadone in breast milk is very small and seems dependent on the dose of methadone that a mother is receiving. The studies are not conclusive about the short-term and long-term developmental consequences of the amount of methadone received by an infant. However, it is suggested that the amount of methadone received by an infant from breast milk is not enough to prevent NAS. Therefore, even though a mother is receiving methadone, her infant may require additional opiate treatment of NAS.

Clinical Management of Mothers on Methadone Who Elect to Breastfeed

There are multiple issues to consider when treating a woman on methadone maintenance who elects to breastfeed. Ideally, these women are in comprehensive treatment facilities where compliance with treatment and relapse potentials are well known, and this information can be shared with infants' medical staff members, provided maternal permission is granted. Women should be counseled during pregnancy regarding the benefits of breast milk as well as problems related to the ingestion of breast milk when relapses occur. Some drug-dependent women who elect to breastfeed should be discouraged from the practice. This group of women

includes those who are unstable in their recoveries and prone to relapse and women who are infected with HIV. Women who engage in frequent sexual risk-taking behaviors (eg, prostitution) are at higher risk for the development of HIV infection and should receive education regarding safe sex practices and access to barrier contraception, but they should not breastfeed. Currently, hepatitis C infection is not a contraindication to breastfeeding,[54] although the Centers for Disease Control and Prevention currently recommend that breastfeeding women with hepatitis C consider abstaining from breastfeeding if their nipples are cracked or bleeding.[55]

Women taking psychotropic medications should have their prescribed medications carefully reviewed by obstetric and gynecologic or pediatric and lactation staff members to determine the relative safety of the drugs ingested, and they should be counseled accordingly. There are many drugs, including antidepressants, antianxiety agents, and some antipsychotic drugs that have unknown safety profiles for lactating women. For women taking these drugs, discussions regarding the risks and benefits of breastfeeding should ensue. A woman who would clearly be unwell after discontinuing psychiatric medication to breastfeed should be discouraged from doing both. Women with body piercings, including pierced nipples, should not be discouraged from breastfeeding, providing their hepatitis status is known and they are aware of risks of future piercings.

Finally, methadone metabolism is enhanced in women on methadone maintenance therapy who become pregnant, frequently necessitating increases in methadone doses during pregnancy to achieve methadone maintenance.[47] Consequently, a well-maintained woman during gestation may frequently find herself overmedicated after delivery. A mother who appears sedated from either overmedication or the stress of delivery compounded by psychological and logistical issues should be frequently and carefully evaluated in the perinatal period while feeding to ensure her infant's safety.

Clinical Management of Breastfed Drug-Exposed Infants

The infants of women on methadone maintenance frequently have medical and neurobehavioral issues that make breastfeeding challenging because of signs and symptoms of NAS, exposure to other drugs during pregnancy, or prematurity. Opiate-exposed infants should be hospitalized after birth for a period of a few days to be observed for signs and symptoms of NAS and monitored carefully using a scoring symptom checklist.[56,57] Adjunctive therapies, such as cardiorespiratory monitoring and/or pulse oximetry, should be available for all methadone-exposed and drug-exposed infants being monitored or treated for NAS.

Having an infant in the appropriate state (alert and relaxed) before beginning breastfeeding can reduce or eliminate many difficulties associated with in utero methadone or drug exposure. Drug-exposed infants may require long periods of intervention before they are able to relax appropriately to feed, and patience, time, and experience with such infants are invaluable tools. Comforting techniques, such as swaddling and vertical rocking, can help.

Because the amount of methadone in breast milk is very small, breastfed, methadone-exposed infants frequently experience NAS symptoms that require pharmacologic treatment. These infants are managed in much the same way as formula-fed infants, with the exception of the dosing schedule. Most infants are treated with either diluted opium or morphine solutions, beginning with the smallest amount of medication that can be used to alleviate their symptoms. The dosage of the medication is then adjusted upward or downward depending on the severity of symptoms on the basis of NAS scoring. Once an infant is comfortably maintained, with relatively low NAS scores, the opiate substitution medication can be decreased. This is accomplished slowly, keeping the infant's symptoms to a minimum, until the infant is weaned off medication. Adjunctive parenting instruction is necessary during this process. For formula-fed infants, the diluted opium or morphine is given every 3 to 4 hours, with feedings. Breastfed infants, however, tend to feed more frequently and in smaller amounts. These infants can be given their medication at every other feeding. Breastfed infants may require more careful monitoring in the neonatal period for the appropriate treatment of NAS as they are more likely to have increased irritable reactivity[58] or to demand feedings more frequently (ie, sleep for shorter intervals) than formula-fed infants. Infants

communicating the need for feedings should not be interpreted as being irritable if they are calmed by nursing and remain calm after disengaging from the breast.

Below is a list of complications to the breastfeeding process that, in our experience, occur frequently among methadone-exposed infants, along with methods that we have found useful in dealing with such problems.

Irritability is a problem frequently encountered in drug-exposed infants. Irritable infants, in our experience, are the most common cause of maternal failure to establish lactation in women on methadone maintenance, whether it is because of maternal guilt and anxiety aroused by a crying baby, difficulty in latching on, or a combination of both. It is important to recognize and address maternal anxiety, particularly with irritable infants, because an anxious mother may potentiate infant irritability. Infants cannot cry and nurse, so careful handling is a critical issue. Putting an infant to the breast while he is still drowsy or before it is fully alert can eliminate some fussiness. Swaddling, vertical rocking, hand holding, gentle cupping of the infant's head if allowed, and minimizing external stimulation by dimming the lights and eliminating excess noise are useful techniques.

State lability, or a rapid fluctuation between states, frequently without achieving the quiet alert state that accompanies nursing, can interfere with lactation. Minimizing stimulation and taking care to bring an infant from a light sleep or drowsy state into a quiet alert state slowly, watching closely for signs of stress, frequently help this group of infants.

Hypertonicity is a frequent problem with methadone-exposed infants. Hypertonicity is usually generalized and may be accompanied by asymmetries. Hypertonic infants may clench their jaws and not open their mouths wide to receive the nipple. Handling care is important for these infants. Gradual oral stimulation, watching for infant cues of overstimulation (such as irritability, hiccups, tremors, excessive gas, gaze aversion, tachypnea, mottling, etc), can be used to establish a root and open mouth. Easily overstimulated infants may respond to oral stimulation with neck arching and side-to-side head thrashing. Applying gentle pressure, as tolerated, to the back of an infant's head and restraining the infant's upper extremities in a soft blanket may diminish thrashing. An arched posture and arched back and neck will contribute to the high tone, and the infant needs to be gradually moved to a rounded-back, more relaxed position using comforting techniques. The football hold is discouraged for high-tone infants, because their heads frequently drop back in this position, and they do better facing their mothers, limbs restrained in a soft blanket. Pulling the infant back and gradually sliding it forward onto the breast while supporting its head in a neutral position works well.

Suck and swallow incoordination or poor or disorganized suck patterns are often found in methadone-exposed and drug-exposed neonates. These issues may benefit from feeding therapy. An infant's tongue must be properly positioned below the nipple, with the areola fully in its mouth. Infants with significant difficulties may fail to thrive, and breastfeeding may be temporarily suspended. In these cases, women can be assisted in expressing milk for delivery to their infants by other means while feeding issues are evaluated and treated.

Hypersensitivity to even minor stimuli can also interfere with lactation. Hypersensitive infants should be breastfed in darkened rooms, with few noises and a comfortable, constant temperature. Handling should be very gentle and minimized. Swaddling can help with many hypersensitive infants but may not be an option with infants who develop fevers. Keep a hypersensitive infant with his mother, lying next to him to feed, with the maternal arm supporting the infant's back and head if tolerated. Avoid any bottle-feedings, even of breast milk, for these infants, because the cold, hard rubber nipple may not be tolerable and may increase infant irritability and decrease the likelihood of the infant latching on. For an infant who thrashes his head or arches his neck with oral stimulation, the compression of the breast along the axis of the infant's mouth can help get more of the nipple into his mouth. Gentle pressure on the infant's head as allowed by the infant and/or a soft receiving blanket wrapped around the upper body and back of the head will minimize thrashing.

Nasal stuffiness is a common confounder to infant feeding for drug-exposed infants, causing them to detach from the nipple, pull back their heads, arch their backs, stiffen, and become irritable. Most infants with nasal stuffiness can breathe through the congestion, but some will require very gentle suctioning with saline drops. It is important to keep mothers from the overuse of the bulb syringe, because this will inflame the nasal mucosa and make hypersensitive infants more irritable.

Vomiting is a problem that is less frequent among breastfed than formula-fed infants, because breastfed infants tend to take smaller amounts of milk more frequently. The thick colostrum may also help keep infants

from spitting up. Frequent burping for infants who swallow air is recommended.

Pull-down is a feature encountered occasionally among methadone- and drug-exposed infants and may represent an effort on the part of the infants to avoid all stimuli and make the environment more tolerable. Frequently, these infants will appear to be sedated or asleep but are actually in an awake or even hypersensitive state. It is natural to think that vigorous stimulation, such as rubbing the back or tickling the infant's feet, may work, but this can actually compound the problem. Intervene with these infants before they are due for feedings, in darkened rooms with gentle handling and rocking or a soft voice to determine what stimuli are tolerable. Undressing the infant and placing it in skin-to-skin contact with its mother or the handler may help. Even very sleepy infants will wake to feed with stimuli appropriate for them. Infants who are not alert enough for any feeding should be brought to the attention of medical staff members because they may require medical intervention or may be overmedicated for NAS.

Pacifier use, though discouraged by many lactation consultants, may have a role in the institution of breastfeeding among certain drug-exposed newborns. There is considerable variability in the expression of acute or subacute NAS, and each infant should be carefully evaluated as an individual to determine its strengths and difficulties. In some infants, the use of a pacifier to establish a calm and relaxed state may be beneficial. At the same time, some infants may react poorly to the introduction of a pacifier, with increased symptoms and difficulty in latching on.

If the above measures do not help with lactation, it is possible that infants are having significant NAS symptomatology and either require medication or are not appropriately (under or over) medicated. It is important that the nursing, lactation, and medical staff members work as a team for the care of these high-risk mothers and infants to provide the appropriate balance of care, because the overmedication or sedation of drug-exposed infants will also interfere with feeding.

Conclusion

For women who have been evaluated and for whom breastfeeding is a viable option, lactation support is critical, ideally from lactation consultants with experience in the care of methadone-exposed and drug-exposed infants. In general, methadone-exposed infants have longer hospital stays than nonexposed infants. This additional hospital time works well for teaching and support. Ideally, substance abuse counselors should provide additional support, which may include intensifying treatment and monitoring in the postpartum period, allowing nursing during individual or group therapy, and retention in treatment for the duration of lactation if possible. Support from clinical care staff members, especially nursing staff members, is also crucial to the success of lactation. Mixed messages, such as staff members providing formula to an infant when the mother is immediately unavailable, despite a supply of refrigerated breast milk, will quickly discourage even a determined breastfeeder and may confuse the infant.

In summary, it seems evident from existent research that the amount of methadone in breast milk is small, that in general the benefits of breast milk seem to outweigh risks involved for many (though not all) women, and that methadone maintenance should not be a contraindication to breastfeeding. Methadone-dependent women, however, require special consideration and should be evaluated by substance abuse treatment and medical staff members prior to their infants' birth regarding their decisions to breastfeed. However, all women in this group should be counseled in reference to the unknown effects of long-term exposure to small amounts of methadone on a developing infant's brain.

References

1. Gfroerer JC. *National Household Survey on Drug Abuse: Population Estimates 1994*. DHHS publication 95-3063. Rockville, MD: Office of Applied Studies; 1995.
2. King JC. Substance abuse in pregnancy: a bigger problem than you think. *Postgrad Med*. 1997;102:135-137, 140-145, 149-150.
3. US General Accounting Office. *Drug Exposed Infants, a Generation at Risk*. Report to the Chairman Committee on Finance, US Senate. Washington, DC: US General Accounting Office; 1990.
4. McCaul M, Svikis D, Feng T. Pregnancy and addiction: outcomes and interventions. *Maryland Med J*. 1991;40:995-1001.
5. Gerstein DR, Johnson RA, Harwood HJ, Fountain D, Suter N, Mallow K. *Evaluating Recovery Services: The California Drug and Alcohol Treatment Assessment (CALDATA), General Report*. Sacramento: California Department of Alcohol and Drug Programs; 1994.
6. Jarvis MAE, Schnoll SH. Methadone treatment during pregnancy. *J Psychoactive Drugs*. 1994;26:155-161.
7. Edelin KC, Gurganious L, Golar K, Oellerich D, Kyei-Aboagye K, Hamid MA. Methadone maintenance in pregnancy: consequences to care and outcome. *Obstet Gynecol*. 1988;71:399-404.
8. Blinick G, Wallach RC, Jerez E, Ackerman BD. Drug addiction in pregnancy and the neonate. *Obstet Gynecol*. 1976;125:135-142.
9. Finnegan L. Treatment issues for opioid-dependent women during the perinatal period. *J Psychoactive Drugs*. 1991;23:191-201.
10. Kandall S. Treatment options for drug-exposed infants. *NIDA Res Monogr*. 1995;149:78-99.

11. American Academy of Pediatrics. The promotion of breastfeeding. *Pediatrics*. 1982;69:654.
12. Cunningham AS, Jelliffe DB, Jelliffe EF. Breastfeeding and health in the 1980's: a global epidemiologic review. *J Pediatr.* 1991;118:659-666.
13. Lawrence RA. *Breastfeeding: A Guide for the Medical Profession*. St. Louis, MO: Mosby Year Book; 1994.
14. Goldman AS. The immunological system in human milk: the past—a pathway to the future. *Adv Nutr Res*. 2001;10:15-36.
15. Saarinen UM. Prolonged breastfeeding as a prophylaxis for recurrent otitis media. *Acta Scand*. 1982;71:567-571.
16. Dewey KG. Is breastfeeding protective against child obesity? *J Hum Lact*. 2003;19:9-18.
17. Kull I, Wickman M, Lilja G, Nordvall SL, Pershagen G. Breastfeeding and allergic diseases in infants—a prospective birth cohort study. *Obstet Gynecol*. 1988;73:399-404.
18. Oddy WH, de Klerk NH, Sly PD, Holt PG. The effects of respiratory infections, atopy, and breastfeeding on childhood asthma. *Eur Respir J*. 2002;19:899-905.
19. Alm B, Wennergren G, Norvenius SG, et al. Breastfeeding and the sudden infant death syndrome in Scandinavia, 1992-95. *Arch Dis Child*. 2002;86:400-402.
20. McVea KL, Turner PD, Peppler DK. The role of breastfeeding in sudden infant death syndrome. *J Hum Lact*. 2000;16:13-20.
21. Anderson JW, Johnstone BM, Remley DT. Breastfeeding and cognitive development: a meta-analysis. *Am J Clin Nutr.* 1999;70:525-535.
22. Golding J, Rogers IS, Emmett PM. Association between breastfeeding, child development and behavior. *Early Hum Devel*. 1997;49(suppl):177-184.
23. Mortensen EK, Michaelsen KF, Sanders SA, Reinisch JM. The association between duration of breastfeeding and adult intelligence. *JAMA*. 2002;287:2365-2371.
24. Jansson LM, Velez M. Understanding and treating substance abusers and their infants. *Infants Young Child*. 1999;11:79-89.
25. Wasserman DR, Leventhal JM. Maltreatment of children born to cocaine-dependent mothers. *Am J Dis Child*. 1993;147:1324-1328.
26. Ballard JL. Treatment of neonatal abstinence syndrome with breast milk containing methadone. *J Perinat Neonat Nurs*. 2001;15:76-85.
27. Altemus M, Deuster PA, Galliven E, Carter CS, Gold PW. Suppression of hypothalamic-pituitary-adrenal axis responses to stress in lactating women. *J Clin Endocrinol Metab.* 1995;80:2954-2959.
28. Heinrichs M, Meinlschmidt G, Nuemann I, et al. Effects of suckling on hypothalamic-pituitary-adrenal axis responses to psychosocial stress in postpartum lactating women. *J Clin Endocrinol Metab*. 2001;86:4784-4804.
29. Institute of Medicine. *Nutrition During Lactation*. Report of the Subcommittee on Nutrition During Lactation of the Committee on Nutritional Status During Pregnancy and Lactation. Washington, DC: National Academy Press; 1991.
30. United Kingdom National Case-Control Study Group. Breastfeeding and risk of breast cancer in young women. *Br Med J*. 1993;307:17-20.
31. Howard CR, Lawrence RA. Breast-feeding and drug exposure. *Obstet Gynecol Clin North Am Subst Abuse Pregnancy.* 1998;25:195-217.
32. American Academy of Pediatrics, Committee on Drugs. The transfer of drugs and other chemicals into human milk. *Pediatrics*. 2001;108:776-789.
33. American Academy of Pediatrics, Committee on Drugs. The transfer of drugs and other chemicals into human milk. *Pediatrics*. 1994;93:137-150.
34. American Academy of Pediatrics, Committee on Drugs. The transfer of drugs and other chemicals into human milk. *Pediatrics*. 1989;84:924-936.
35. Ludington-Hoe SM, McDonald PE, Satyshur R. Breastfeeding in African-American women. *J Natl Black Nurses Assoc*. 2002;13:56-64.
36. Li R, Zhen Z, Mokdad A, Barker L, Grummer-Strawn L. Prevalence of breastfeeding in the United States: the 2001 National Immunization Survey. *Pediatrics*. 2003;111:1198-1201.
37. Bentley ME, Dee D, Jensen JL. Breastfeeding among low income, African-American women: power, beliefs and decision making. *J Nutr.* 2003;133:305S-309S.
38. Marsh JC, Miller NA. Female clients in substance abuse treatment. *Int J Addict*. 1985;20:995-1019.
39. US Department of Health and Human Services. HIV/AIDS surveillance report. Vol 11. Available at: http://www.cdc.gov/hiv/stats/hasr1101.pdf. Accessed October 6, 2003.
40. Burns KA, Melamed J, Burns WJ, Chasnoff IJ, Hatcher R. Chemical dependence and clinical depression in pregnancy. *J Clin Psychol*. 1985;41:851-854.
41. Regan DO, Rudrauff ME, Finnegan LP. Parenting abilities in drug dependent women: the negative effects of depression. *Pediatr Res*. 1985;14:454.
42. Velez M, Jansson L, Svikis D, Jones H, Walters V, Chilcoat H. Physical, sexual and emotional abuse in pregnant substance dependent women. *Drug Alcohol Dependence*. 2001;63(suppl 1):S163.
43. Kandall-Tackett K. Breastfeeding and the sexual abuse survivor. *J Hum Lact*. 1998;14:125-130.
44. Kreek MJ, Schecter A, Gutjahr CL, et al. Analyses of methadone and other drugs in maternal and neonatal body fluids: use in evaluation of symptoms in a neonate of mother maintained on methadone. *Am J Drug Alcohol Abuse*. 1974;1:409-419.
45. Blinick G, Inturrisi CE, Jerez E, Wallach RC. Methadone assays in pregnant women and progeny. *Am J Obstet Gynecol*. 1975;121:617-621.
46. Kreek MJ. Methadone disposition during the perinatal period in humans. *Pharmacol Biochem Behav.* 1979;11:7-13.
47. Pond SM, Kreek MJ, Tong TG, Raghunath J, Benowitz NL. Altered methadone pharmacokinetics in methadone-maintained pregnant women. *J Pharmacol Exp Ther.* 1985;233:1-6.
48. Geraghty B, Graham EA, Logan B, Weiss EL. Methadone levels in breast milk. *J Hum Lact*. 1997;13:227-230.
49. Wojnar-Horton RE, Kristensen JH, Yapp P, Ilett KF, Dusci LJ, Hackett LP. Methadone distribution and excretion into breast milk of clients in a methadone maintenance program. *Br J Clin Pharmacol*. 1997;44:543-547.
50. McCarthy JJ, Posey BL. Methadone levels in human milk. *J Hum Lact*. 2000;16:115-120.
51. Begg EJ, Malpas TJ, Hackett LP, Ilett KF. Distribution of R- and S-methadone into human milk during multiple, medium to high oral dosing. *Br J Clin Pharmacol*. 2001;52:681-685.
52. Smialek JE, Monforte JR, Aronow R, Spitz WU. Methadone deaths in children. *JAMA*. 1977;238:2516-2517.
53. Malpas TJ, Darlow BA. Neonatal abstinence syndrome following abrupt cessation of breastfeeding. *N Z Med J*. 1999;112:12-13.
54. Lin H, Kao J, Hsu H, Ni L, Chen P, Chen D. Absence of infection in breast-fed infants born to hepatitis C virus-infected mothers. *J Pediatr.* 1995;126:589-591.
55. Centers for Disease Control and Prevention. Viral hepatitis C: frequently asked questions. Available at: http://www.cdc.gov/ncidod/diseases/hepatitis/c/faq.htm. Accessed October 17, 2002.
56. Finnegan LP, Connaughton JF, Kron RE, Emich JP. Neonatal abstinence syndrome: assessment and management. *Addict Dis*. 1975;2:141-158.
57. Finnegan LP, Kaltenback K. Neonatal abstinence syndrome. In: Hoekelman RA, ed. *Primary Pediatric Care*. St. Louis, MO: Mosby Year Book; 2001.
58. DiPietro JA, Larson SK, Porges SW. Behavioral and heart rate pattern differences between breast-fed and bottle-fed neonates. *Dev Psychol*. 1987;23:467-474.

Resumen

Mantenimiento de metadona y lactancia: revisión de la literatura y guía actualizada para el manejo

La metadona ofrece beneficios terapéuticos significantes a la población de mujeres embarazadas con dependencia a opiáceos, y es el tratamiento de elección para este grupo. Ahora, el problema de mujeres que están en mantenimiento de metadona y que eligen amamantar fastidia a los proveedores. Al mismo tiempo que la leche materna ofrece ventajas claramente beneficiosas para la población de niños en general, se ha debatido la recomendación de la lactancia a mujeres postparto en mantenimiento de metadona. Aun cuando los estudios de investigación han demostrado que la cantidad de metadona en la leche materna es muy poca, siendo así segura, las mujeres que reciben metadona con frecuencia no amamantan por múltiples razones. Este artículo provee una revisión de situaciones que enfrentan los proveedores al tratar mujeres en mantenimiento de metadona y que deciden amamantar. Se presenta una revisión de la literatura en este tema, y al mismo tiempo recomendaciones clínicas para proveedores que cuidan de esta población de mujeres y niños.